

REMARKS

Claims 1-26 are pending in the application after this amendment. The amendment of claims is not to be considered in any way an indication of applicants' position on the merits of the amended claims. In the following sections of the Amendment the rejections set forth by the Examiner in the April 7, 2004, Office action are addressed.

The specification has been amended to correct minor errors of which applicants are aware. For example, the original text of the specification used colors to refer to the curves in the figure, but because the figure submitted in the patent application was in black and white, the specification has been amended to refer to the curves by their labels. No new matter has been added in these amendments. It is submitted that these amendments should not be objectionable.

Applicants have amended FIG. 7 so that it correctly refers to FIG. 6 (and not FIG. 7) in steps 110 and 114. Support for this amendment can be found in the original specification at page 11, lines 11-24. Applicants respectfully request that an indication that the drawings are acceptable be given.

Applicants also submit herewith (1) a copy of the two page Information Disclosure Statement (IDS) submitted at filing and (2) a copy of the return receipt postcard in which receipt of the IDS (and the attached references) was acknowledged. Applicants respectfully request that the references set forth on the IDS be considered and acknowledged.

In the Office action claims 1-2, 6-7, 9-15, and 21-22 were rejected under 35 USC §102(e) as anticipated by U.S. Patent No. 6,714,593 to Benzler et al. (the "Benzler reference"). Claims 3 and 5 were rejected under 35 USC §103 as obvious over the Benzler reference in view of U.S. Patent No. 5,767,907 to Pearlstein (the "Pearlstein reference"). Claims 16-20 were rejected under 35 USC §103 as obvious over the Benzler reference in view of U.S. Patent No. 6,249,318 to Girod et al. (the "Girod reference"). Claim 8 was rejected under 35 USC §103 as obvious over the

Benzler reference in view of the Pearlstein reference and the Girod reference. These rejections are respectfully traversed, and detailed arguments are set forth below.

Claim 4 was not specifically rejected and applicants respectfully request clarification. For purposes of this response, because claim 4 is dependent on claim 1, applicants respectfully submit that claim 4 would be allowable for the same reasons as claim 1 as well as for the additional reasons contained therein. Also, new independent claim 23 has been added. This new claim includes subject matter from the original claim 1 and claim 4. As claim 4 was not specifically rejected, applicants have assumed that its subject matter, and that of new claim 23, would be allowable.

Before reviewing the cited references, applicants would like to discuss the distinction between "distortion" and "rate-distortion." Distortion deals with finding a motion vector to compensate a reference frame to obtain an image as close to the current frame as you can in terms of some distortion metric. Rate-distortion is a joint optimization of the distortion and the cost of transmitting the coded motion vectors. As will be discussed, the Benzler reference deals with distortion and the Girod reference deals with rate-distortion.

The Benzler reference is directed to a motion compensating prediction of moving image sequences that is primarily concerned with producing better images. Specifically the Benzler reference searches for the best motion vector to produce the best quality image, (minimize distortion) regardless of cost. The process of the Benzler process begins with the reference image being transmitted to the decoder. Benzler then specifically requires three search steps to find the best motion vector for the macroblock: a first search step at full pel precision, a second search step at sub-pel precision (e.g. $\frac{1}{2}$ pel precision), and a third search step at an increased resolution (e.g. $\frac{1}{4}$ pel precision). Each of these steps is performed prior to transmission of the final best motion vector for the macroblock and none of the intermediate best motion vectors are transmitted to the decoder. At each step, Benzler specifies that the minimum of the error criterion (alternatively referred to as the lowest prediction error capacity) for possible movement positions is determined and the vector is selected that best

describes the motion of the image block. The minimum of the error criterion, like the mean squared error ("MSE") and mean absolute difference ("MAD") criteria (discussed at page 9, line 16 – page 10, line 2 of the present application), does not take into account the cost in bits of actually encoding the vector. In other words, a given motion vector may minimize the minimum of the error, but it may be very costly to encode with bits, so it may not be the best choice from an coding standpoint. It should be noted, however, that Benzler does not appear concerned with coding efficiency for these motion vectors. Perhaps this is because Benzler transmits only the best motion vector of the macroblock, but not any of the intermediate motion vectors, from one location to another.

The Girod reference is directed to a video coding/decoding arrangement and method therefore that selects the best frame of multiple reference frames. Put another way, the Girod reference teaches rate-distortion-based frame selection from multiple reference frames residing in frame memory. The Girod arrangement and method uses a proposed bit allocation scheme to provide increased coding efficiencies of the video codec. Because the Girod reference adds the additional parameter of reference frame selection (which would require significant computation expense) and because the Girod reference deals with information and coding that is to be transmitted from one location to another, there are significant advantages for coding efficiencies. Girod, therefore, is not exclusively concerned with image quality. Accordingly, he does joint optimization of rate and distortion. When selecting the best reference frame from multiple reference frames, he not only considers the distortion but also the transmission cost involved with that selection. The best motion vectors are then found and/or selected with respect to that reference frame.

The Examiner specifically cites the Girod reference as disclosing "using a rate-distortion cost measurement for coding vectors in order to make judicious use of the coding bit budget." However, without any admission that a reference exists that teaches or suggests this claimed element of finding a best motion vector for a macroblock using rate-distortion criteria, such a reference is irrelevant if the Examiner

cannot provide a suggestion to combine or modify the references. Applicants believe that the Girod reference does not provide a teaching or suggestion of the claimed element of finding a best motion vector for a macroblock using rate-distortion criteria.

Applicants respectfully submit that the Examiner has not met his burden of presenting the prima facie case of obviousness with respect to his 35 U.S.C. Section 103 rejection based on the combination of the Benzler reference and the Girod reference. The Examiner stated that the individual references contained elements of the rejected claims. The Examiner then stated that "given this teaching it would have been obvious for one of ordinary skill in the art to incorporate the Girod teaching of using a rate-distortion cost measurement for selecting motion vectors in order to make judicious use of the coding bit budget of the Benzler method." In other words, it appears that the Examiner is finding the prima facie element of obviousness of a suggestion to combine or modify the references in the fact that one of ordinary skill would have been aware of the techniques of the invention. This is not enough when the elements (in this case, the different types of criteria) solve different problems. As the Examiner is well aware, simply because a claimed invention employs known principles (although there is no admission that all the claimed principles were known) does not itself establish that the invention would have been obvious. As set forth above, the Benzler method is concerned only with the quality of images whereas the Girod reference is also concerned with coding efficiencies that become significant with the computational demands of multiple reference frame selection and with transmission. Accordingly, the Benzler method uses a criteria (minimum of the error criterion) that its inventors believed would produce the best image and the Girod reference uses a criteria (rate-distortion criteria) that its inventors believed would produce the best coding efficiencies. Since Benzler was not concerned with coding efficiencies, it is unlikely that he would have replaced his minimum of the error criterion with the rate-distortion criteria set forth in the Girod reference. This is particularly true with the intermediate best motion vectors that are never transmitted to the decoder. Because the elements deal with different problems, applicants respectfully submit that the Examiner has not provided a

suggestion to combine or modify the references and, therefore, has not met his burden of presenting the prima facie case of obviousness with respect to his 35 U.S.C. Section 103 rejection based on the combination of the Benzler reference and the Girod reference.

The Examiner is respectfully reminded that the mere fact that the references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). There is no teaching in either reference that such a combination is desirable. Further, although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so." *In re Fritch*, 972 F.2d at 682, 16 USPQ2d at 1432.) There is no suggestion or motivation in either reference to do so. Applicants respectfully remind the Examiner that it is improper to use a high level of skill, the present claims, and/or hindsight to combine the Benzler and Girod references.

Finally, the proposed modification cannot change the principle of operation of a reference. The Girod rate-distortion criteria could not be directly substituted into the Benzler method without substantially and significantly changing the structure of the Benzler codec in that the Girod rate-distortion criteria is critically dependent on multiple reference frames. In fact, Girod, at column 10, lines 39-40, specifically states that "long-term memory (i.e., the number of reference frames) as demonstrated for 2, 5, 10, and 50 frames, gives performance improvement over the single reference frame case (i.e., those curves shown as H.263 and TMN)." This teaches away from a single reference frame, and thus moving further from Benzler. Substituting the Girod rate-distortion criteria for the Benzler minimum of the error criterion would produce an efficiently coded motion vector, not the Benzler best motion vector to produce the best quality image.

Regarding claim 1, applicants have amended the claim to state that at least one of the criteria used to determine best motion vector is a rate-distortion criteria. The known references taken singly or in combination, do not teach or suggest the subject matter of the amended claim and, therefore, this claim should be allowable.

Claims 2-8 and 24 depend on claim 1 and are allowable for the same reasons as well as for the individual limitations contained therein and applicants respectfully reserve the right to present arguments thereto in future communications.

Regarding claim 9, applicants have amended the claim to state that at least one of the criteria used to determine best motion vector is a rate-distortion criteria. The known references taken singly or in combination, do not teach or suggest the subject matter of the amended claim and, therefore, this claim should be allowable. Claims 10-15 and 25 depend directly or indirectly on claim 9 and are allowable for the same reasons as well as for the individual limitations contained therein and applicants respectfully reserve the right to present arguments thereto in future communications.

Regarding claim 16, as originally presented, specifically included the step of selecting the best motion vector of the first and at least one second best motion vectors using rate-distortion criteria. Applicants have amended the claim to correct a minor grammatical error. The known references taken singly or in combination, do not teach or suggest the subject matter of the amended claim and, therefore, this claim should be allowable. Claims 17-19 depend on claim 16 and are allowable for the same reasons as well as for the individual limitations contained therein and applicants respectfully reserve the right to present arguments thereto in future communications.

Regarding claim 20, applicants have amended the claim to state that at least one of the criteria used to determine best motion vector is a rate-distortion criteria. The known references taken singly or in combination, do not teach or suggest the subject matter of the amended claim and, therefore, this claim should be allowable.

Regarding claim 21, applicants have amended the claim to include the step of searching at a motion accuracy for a best motion vector of said macroblock using rate-distortion criteria. The known references taken singly or in combination, do not teach or suggest the subject matter of the amended claim and, therefore, this claim should be allowable. Claims 22 and 26 depend on claim 21 and are allowable for the same reasons as well as for the individual limitations contained therein and applicants respectfully reserve the right to present arguments thereto in future communications.

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It should be noted that applicants have amended many of the pending claims to include a limitation relating to at least one best motion vector being found using rate-distortion criteria. Applicants have made these amendments for the purpose of furthering prosecution, but reserve the right to file continuation applications.

Reconsideration of the claims is respectfully requested in view of the above amendments and remarks, and early notice of allowance thereof is earnestly solicited.

Please charge Deposit Account No. 50-2115 for any additional fees which may be required.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Karen Oster", written over a horizontal line.

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